

CLAIMS

What is claimed is:

- 1 1. A magnetic disk protection mechanism, comprising:
2 an information acquisition mechanism for acquiring information about an
3 environmental change of a magnetic disk device;
4 a shock prediction mechanism for analyzing the information acquired by said
5 information acquisition mechanism together with a history thereof, and for
6 determining a status of where said magnetic disk device is used, so as to
7 perform a shock prediction; and
8 a control mechanism for controlling operations of said magnetic disk device
9 including a magnetic head escape operation based on a prediction result by
10 said shock prediction mechanism.

- 1 2. The magnetic disk protection mechanism according to claim 1, wherein if a
2 variation in the status where said magnetic disk device is used falls within a
3 specified range for a specified period, said shock prediction mechanism does not
4 predict that a shock will be caused by the variation in the status.

- 1 3. The magnetic disk protection mechanism according to claim 1, wherein if the
2 status of where said magnetic disk device is used varies in a predetermined

3 pattern, said shock prediction mechanism predicts that a shock will be caused by
4 the variation in the status.

1 4. The magnetic disk protection mechanism according to claim 1, wherein said
2 shock prediction mechanism predicts a shock with reference to a history of input
3 operations provided by a predetermined input device.

1 5. The magnetic disk protection mechanism according to claim 1, wherein said
2 information acquiring mechanism acquires information on acceleration of said
3 magnetic disk device, and said shock prediction mechanism recognizes the status
4 where the magnetic disk device is used based on the acceleration information
5 acquired by said information acquiring mechanism.

1 6. The magnetic disk protection mechanism according to claim 1, wherein if said
2 shock prediction mechanism determines that said magnetic disk device is stable,
3 the shock prediction mechanism notifies said control mechanism that said
4 magnetic disk device is stable, and said control mechanism returns said escaping
5 magnetic head in response to said notification.

1 7. The magnetic disk protection mechanism according to claim 6, wherein said
2 shock prediction mechanism adaptively determines whether or not said magnetic
3 disk device is stable, based on a history of the information acquired by said
4 information acquiring mechanism before a shock is predicted to occur.

1 8. The magnetic disk protection mechanism according to claim 1, wherein if said
2 magnetic head has escaped, said control mechanism holds a new access request to
3 the magnetic disk device in an internal queue instead of realizing the access
4 request until said shock prediction mechanism determines that said magnetic disk
5 device is stable.

1 9. A magnetic disk protection mechanism, comprising:
2 a status determination mechanism for determining a status of where said magnetic
3 disk device is used; and
4 a control mechanism for controlling operations of said magnetic disk device
5 including a magnetic head escape operation based on a determination
6 result by said status determination mechanism,
7 wherein, when said status determination mechanism determines that there is a
8 high probability of excessive shock to said magnetic disk device, said
9 control mechanism divides an access request to said magnetic disk device
10 into access requests with a small data size per access and transmits the
11 access request to said magnetic disk device.

1 10. The magnetic disk protection mechanism according to claim 9, wherein if said
2 magnetic head escapes before at least some of said access requests obtained by
3 the division are realized, said control mechanism saves the access requests that

4 have not been realized yet and realizes these requests after returning said
5 magnetic head.

1 11. The magnetic disk protection mechanism according to claim 9, wherein, instead
2 of said control mechanism dividing an access request to said magnetic disk device
3 into access requests with a small data size per access and transmitting the access
4 request to said magnetic disk device, said control mechanism invalidates a write
5 cache function that performs an access to a magnetic disk in said magnetic disk
6 device when said status determination mechanism determines that there is a high
7 probability of excessive shock to said magnetic disk device.

1 12. The magnetic disk protection mechanism according to claim 11, wherein, instead
2 of said control mechanism invalidating a write cache function that performs an
3 access to a magnetic disk in said magnetic disk device, for each data writing in a
4 cache memory, said control mechanism writes said data to a magnetic disk so as
5 to empty said cache memory.

1 13. A magnetic disk protection mechanism, comprising:
2 a shock prediction mechanism for predicting a possible shock to a magnetic disk
3 device, based on a variation in at least one physical parameter of an
4 environment of the magnetic disk device;

5 a control mechanism for controlling operations of said magnetic disk device
6 including a magnetic head escape operation based on a prediction result by
7 said shock prediction mechanism; and
8 a diagnosis mechanism for operating if a shock actually occurs after said control
9 mechanism has started causing a magnetic head to escape, to determine
10 whether or not the magnetic head has escaped before the occurrence of the
11 shock.

1 14. The magnetic disk protection mechanism according to claim 13, wherein said
2 diagnosis mechanism makes said determination by comparing a pre-shock period,
3 that is a time from a start of an escape operation of the magnetic head until the
4 occurrence of a shock, with an already measured and restored escape time
5 required for the escape operation of the magnetic head.

1 15. The magnetic disk protection mechanism according to claim 14, wherein if the
2 magnetic head has already escaped before the magnetic head starts an escape
3 operation under the control of said control mechanism, said diagnosis mechanism
4 does not compare said pre-shock period with said escape time but determines that
5 the magnetic head has completely escaped before the occurrence of said shock.

1 16. The magnetic disk protection mechanism according to claim 15, wherein if said
2 control mechanism issues a request command requesting performance of an
3 escape operation under the control of said control mechanism and then within a

4 specified time, acquires a notification indicating that the command has been
5 completed, then said diagnosis mechanism determines that the magnetic head had
6 already escaped when the magnetic head started an escape operation.

1 17. A computer system comprising a magnetic disk device, said computer system
2 further comprising:
3 an acceleration sensor for detecting an acceleration of a housing coupled to said
4 magnetic disk device;
5 a shock manager for analyzing acceleration information acquired by said
6 acceleration sensor and a history thereof, to predict a probability of shock
7 to said magnetic disk device; and
8 a driver for controlling said magnetic disk device operation including a disk head
9 escape operation based on a prediction result by said shock manager.

1 18. The computer system according to claim 17, further comprising a diagnosis
2 processing section for operating if a shock actually occurs after said driver has
3 started causing a magnetic head to escape, to determine whether or not the the
4 magnetic head has escaped before the occurrence of the shock.

1 19. The computer system according to claim 18, wherein if said diagnosis processing
2 section determines that a shock occurred before the magnetic head escape was
3 completed, said diagnosis processing section provides a user notification warning
4 a user that a fault may have occurred in the magnetic disk device.

1 20. A computer system comprising a magnetic disk device, said computer system
2 further comprising:
3 a shock manager for determining a status where a housing of said shock manager
4 is used to predict a shock to said magnetic disk device; and
5 a driver for dividing an access request to said magnetic disk device into access
6 requests with a small data size per access and for transmitting to said
7 magnetic disk device when said shock manager finds a high possibility of
8 excessive shock to said magnetic disk device.

1 21. The computer system according to claim 20, wherein the driver, instead of
2 dividing an access request to said magnetic disk device into access requests with a
3 small data size per access and for transmitting to said magnetic disk device,
4 invalidates a write cache function that performs an access to a magnetic disk of
5 said magnetic disk device when said shock manager finds a high possibility of
6 excessive shock to said magnetic disk device.

1 22. A magnetic disk protection method of protecting a magnetic disk by using a
2 sensor to determine a status where a magnetic disk device is used and by having a
3 magnetic head escape depending on a determination result, said magnetic disk
4 protection method comprising:
5 accumulating information histories acquired by said sensor,

6 analyzing the accumulated histories and the latest said information to recognize a
7 change pattern of said magnetic disk device status, and
8 based on a content of said change of said magnetic disk device status, executing a
9 magnetic head escape operation when a shock to said magnetic disk
10 device is predicted.

1 23. A magnetic disk protection method of protecting a magnetic disk by using a
2 sensor to determine a status where a magnetic disk device is used and by having a
3 magnetic head escape depending on a determination result, said magnetic disk
4 protection method comprising:
5 based on an output by said sensor, determining a status of where said magnetic
6 disk device is used;
7 controlling operations of division of an access request to said magnetic disk
8 device into access requests with a small data size per access and of
9 transmission to said magnetic disk device when a high possibility of
10 excessive shock to said magnetic disk device is predicted; and
11 executing a magnetic head escape operation when a shock to said magnetic disk
12 device is found.

1 24. The method according to claim 23, wherein instead of controlling operations of
2 division of an access request to said magnetic disk device into access requests
3 with a small data size per access and of transmission to said magnetic disk device,
4 operations to invalidate a write cache function that performs an access to a

5 magnetic disk in said magnetic disk device are controlled when a high possibility
6 of excessive shock to said magnetic disk device is found.

1 25. The method according to claim 23, wherein instead of controlling operations of
2 division of an access request to said magnetic disk device into access requests
3 with a small data size per access and of transmission to said magnetic disk device,
4 for each data writing in a cache memory, controlling an operation of writing of
5 data to a magnetic disk so as to empty said cache memory when a high possibility
6 of excessive shock to said magnetic disk device is found.

1 26. A magnetic disk prediction method of protecting a magnetic disk by using a
2 sensor to determine a status of where said magnetic disk device is used and by
3 having a magnetic head escape depending on a determination result, said
4 magnetic disk prediction method comprising:
5 based on a variation in an environment of the magnetic disk device, predicting a
6 possible shock to the magnetic disk device;
7 based on a result of said prediction, controlling operations of said magnetic disk
8 device including a magnetic head escape operation; and
9 if a shock actually occurs after a magnetic head has started escaping, determining
10 whether or not the magnetic head escape has been completed before the
11 occurrence of the shock, by comparing a pre-shock period, that is a time
12 from a start of an escape operation of the magnetic head until the

13 occurrence of a shock, with an already measured and restored escape time
14 required for the escape operation of the magnetic head.

1 27. The method according to claim 26, wherein in the step of determining whether or
2 not the magnetic head escape has been completed before the occurrence of said
3 shock, if the magnetic head has already escaped before the magnetic head starts
4 an escape operation, the comparison of said pre-shock period with said escape
5 time is not carried out but it is determined that the magnetic head has completely
6 escaped before the occurrence of said shock.

1 28. A program for controlling a computer to implement a magnetic disk device
2 protection mechanism, comprising:
3 code for acquiring information on an environmental change toward a magnetic
4 disk device and storing the information in a predetermined storage
5 mechanism;
6 code for analyzing said acquired information and a history of the information
7 accumulated in said storage mechanism, and for determining a status of
8 where said magnetic disk device is used, so as to perform a shock
9 prediction; and
10 code for controlling operations of said magnetic disk device including a magnetic
11 head escape operation based on a result of said shock prediction.